APPLICATION

FOR

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TITLE: SHAVING RAZORS, AND BLADE SUBASSEMBLIES THEREFOR AND METHODS OF MANUFACTURE

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Shaving Razors, and Blade Subassemblies Therefor and Methods of Manufacture

The invention relates to shaving razors, and blade subassemblies therefor and methods of manufacture.

Shaving razors often include a plurality of blades that are secured in a desired position in a plastic housing. The housing is often provided with a guard with fins or other skin engaging structures made of elastomeric material in front of the blades, and a cap on which the skin can slide behind the blades. A shaving aid (e.g., a lubricant agent dispensing mechanism) can be incorporated into the cap and, in some cases, the guard. The blades can be stationary or movable, and the housing can be fixed to a handle or movably mounted on the handle, to, e.g., assist in following the contours of the skin during shaving.

Examples of some different types of shaving razors are described in U.S. Patents Nos. 5,313,706; 5,369,885; 5,416,974; 5,546,660; 6,032,372; 6,145,201; 6,161,288; 6,216,345; 6,216,561; and 6,397,473.

Summary of the Invention

In one aspect, the invention features, in general, a subassembly for a shaving razor that includes a plurality of elongated metal blades that are secured to each other as an integral unit. The plural blades have cutting edges defining a shaving surface, and are secured to each other by weld connections at their respective longitudinal ends.

Particular embodiments of the invention may include one or more of the following features. In particular embodiments, the longitudinal ends of the blades are bent and are transverse to the cutting edges. In some embodiments, the unit includes two metal plates, and one set of longitudinal ends are connected by first weld connections to a first metal plate, and the other set of longitudinal ends are connected by second weld connections to a second metal plate. The plates can have a stainless steel base and an aluminum cladding thereover. In some other embodiments, one set of longitudinal ends of the blades overlap and are welded to adjacent ends at one side of the unit, and the other set of longitudinal ends of the blades overlap and are welded to adjacent ends at the other

side of the unit. In some embodiments each blade includes an elongated cutting member having a cutting edge and an elongated support to which the elongated cutting member is attached, with the longitudinal ends of the elongated support being welded to each other at the two sides. In some other embodiments, each blade includes an elongated cutting member portion having a cutting edge and an integral elongated support portion bent downward from the cutting member portion, with the longitudinal ends of the elongated support portion being welded to each other at the two sides. In still other embodiments, each blade includes an elongated cutting member having a cutting edge, and the longitudinal ends of the elongated cutting member are welded to each other at the two sides. The subassembly can have two blades, three blades, four blades or five blades or more. The cutting edges can be located in a common plane. The subassembly can have a snap-fitting structure for connection to a housing of a shaving razor.

In another aspect the invention features, in general, a shaving razor including a subassembly as already described, and a housing having a recess in which the subassembly is secured.

In another aspect the invention features, in general, a method of making a shaving razor that includes providing a plurality of elongated metal razor blades having cutting edges and first and second longitudinal ends, positioning the cutting edges parallel to each other and spaced from adjacent cutting edges so as to define a shaving surface, connecting the first longitudinal ends to each other and the second longitudinal ends to each by welding while the cutting edges are maintained parallel to each other.

Particular embodiments of the invention may include one or more of the following features. In particular embodiments a fixture is used to align the blades in parallel planes and to position the cutting edges at desired positions. The fixture has slots to align the blades and stop surfaces to position the cutting edges. The integral unit of blades is positioned into a recess in a housing. The recess can be open to the top, with, e.g., the integral blade unit being lowered into the recess and held in place by clips or by snap-fitting, or the recess can open to the bottom, with the integral blade unit being raised into the recess.

Embodiments of the invention may include one or more of the following advantages. Automated assembly of razor blade cartridges can be simplified by installing

all of the blades as a unit in a single step. The geometry of the cutting edges with respect to each other can be set prior to assembly, e.g., with a fixture, and tightly controlled and varied, if desired. The subassembly of blades can be removably mounted in a housing and replaced with a new subassembly as the blades become spent, thereby decreasing the parts that are disposed and reusing more parts. Also, integrated blade unit subassemblies can be manufactured with a variety of different blade geometries, with, e.g., different blade tangent angles, exposures, and/or spans, and the different subassemblies can all be used with a common design for the rest of the cartridge into which they are inserted, simplifying part count and tooling at the same time that a variety of different geometries can be easily implemented.

Other advantages and features of the invention will be apparent from the following description of particular embodiments thereof and from the claims.

Brief Description of the Drawings

Fig. 1 is a partial, perspective view of a shaving razor.

Fig. 2 is an exploded, partial, perspective view of the Fig. 1 shaving razor.

Fig. 3 is a perspective view of a blade subassembly of the Fig. 1 shaving razor.

Fig. 4 is a plan view of the Fig. 3 blade subassembly.

Fig. 5 is a front elevation of the Fig. 3 blade subassembly.

Fig. 6 is a side elevation of the Fig. 3 blade subassembly.

Fig. 7 is a perspective view of a blade of the Fig. 3 blade subassembly.

Fig. 8 is a partial diagrammatic plan view illustrating blade and side plate components of the Fig. 3 blade subassembly.

Fig. 9 is a diagrammatic side view of fixture used in the manufacture of the Fig. 3 blade subassembly.

Fig. 10 is a diagrammatic, partial, exploded view of an alternative embodiment of a blade subassembly that does not have side plates.

Fig. 11 is an elevation of an alternative embodiment of a blade subassembly that is replaceable.

Figs. 12-13 are perspective views of alternative, one-piece blade constructions.

Figs. 14-16 are a perspective view of two-, three- and four-blade alternative subassemblies, respectively, for use in the Fig. 1 shaving razor.

Detailed Description

Referring to Fig. 1, shaving razor 10 includes plastic housing 12, blades 14 secured in housing 12, cap 16(including a lubricating strip), handle 18, connecting piece 19 (which is pivotally connected to housing 12 and removably connected to handle 18), and elastomeric guard 20 which has fins 22. There are five blades 14 having cutting edges 28 (see Fig. 7) that define a shaving surface. As appears from Fig. 2, blades 14 are provided in an integrated blade subassembly 13 that mounts in recess 21 in housing 12 from the top and is held in place by two clips 23, only one of which is shown in Fig. 2.

Referring to Figs. 3-8, blade subassembly 13 includes five blades 14 and two side plates 24. Plates 24 have a stainless steel base and an aluminum cladding thereover for corrosion resistance. However, corrosion resistance can be achieved by other means and materials, such as by the contact with a separate cartridge component that acts as a sacrificial anode such as an aluminum clip or a separate zinc component.

Each blade 14 includes an elongated cutting member 26 having cutting edge 28 and elongated support 30 to which cutting member 26 is attached by spot welds 32. Elongated support 30 has an angled section along its length, with a short upper portion 34 and longer base portion 36. The longitudinal ends 38 of base portion 36 are bent 90°, and are secured to side plates 24 by spot welds 40.

Alternatively, the elongated cutting members could be one-piece constructions having a cutting edge portion and an integral bent base portion, as shown, e.g., for one-piece complex member 39 in Fig. 12, or not even have a bent base portion, as shown, e.g., for one-piece simple cutting member 41 in Fig. 13.

Referring to Fig. 9, fixture 42 is used to position blades 14 while they are welded to side plates 24 by spot welds 40. Fixture 42 has base member 44 that includes slots 46 that receive base portions 36 of elongated supports 30 of blades 14. Bladder 46 provides an upward force to the bottoms of base portions 36, to cause cutting members 26 to abut angled surfaces 48 of alignment block 50, and cutting edges 28 to contact corners 52, thereby placing the cutting edges 28 in the desired position to define a shaving surface, and providing the desired blade tangent angle for cutting members 26. With blades 14

properly positioned in slots 46 and biased upward against surfaces 48 and corners 52, side plates 24 are welded to bent longitudinal ends 38, resulting in an integral blade subassembly 30, that can then be simply inserted into recess 21 and moved into position in housing 12 and secured therein by clips 23 (Figs. 1, 2). Alternatively, the blades could also be rear mounted into a cartridge housing that has a recess 21 that opens from the bottom. Also, if desired, alignment block 50 can allow for different blades to have different blade tangent angles, exposures and/or spans by different positions for angled surfaces 48 and corners 52 of alignment block 50.

Referring to Fig. 10, alternative blade subassembly 60 (shown prior to attachment of the last blade 62) differs from blade subassembly 30 in that it does not have side plates 24, but instead has offset extensions 64 on the longitudinal ends 66 that overlap and are welded to portions 68 of the prior blade 62 by welds 70.

Referring to Fig. 11, alternative blade subassembly 76 has angled side plates 78 that are snap-fit into housing 12 and held in housing 12 without the need for clips 23. When the blades need to be replaced, instead replacing the entire cartridge (including housing 12 and connecting piece 19 as well as the blades) one pushes the used subassembly 76 out from the bottom, and simply snaps in a new subassembly 76, permitting the housing 12 and connecting piece 19 to be used multiple times. Alternatively, side plates 78 could be slidably mounted in guide slots (not shown) in the housing to allow the blades to be floating, sliding up and down, in the cartridge.

Other embodiments of the invention are within the scope of the appended claims. For example, other techniques (such as elastomeric materials, magnetism, solenoids, and springs) can be used in place of bladder 46 to bias the blades 14 into the proper position. Other structures or shapes can be used in place of angled surfaces 48 and corners 52 to align the blades. Oval spots and dual spots can be used in place of the round spot welds 40 and 70.

There can be any number of blades, (e.g., 2, 3, 4, 5, 6, 7, etc). Two-, three- and four-blade subassemblies 80, 82, 84, respectively, are shown in Figs. 14-16, respectively. Also, the cartridge and handle may be integral parts such as a disposable razor.

Listing of reference numerals

shaving razor 10

plastic housing 12

integrated blade subassembly 13

blades 14

cap 16

handle 18

connecting piece 19

elastomeric guard 20

recess 21

fins 22

clips 23

side plates 24

cutting member 26

cutting edge 28

elongated support 30

spot welds 32

short upper portion 34

longer base portion 36

longitudinal ends 38

one-piece complex cutting member 39

spot welds 40

one-piece simple cutting member 41

fixture 42

base member 44

slots 46

angled surfaces 48

alignment block 50

corners 52

alternative blade subassembly 60

last blade 62

offset extensions 64

longitudinal ends 66

prior blade portions 68

welds 70

alternative blade subassembly 76

angled side plates 78

Two-blade subassembly 80

Three-blade subassembly 82

Four-blade subassembly 84